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Unknown, Unloved? Teachers' Reported Use and Effectiveness of Classroom Management Strategies for Students with Symptoms of ADHD

Geraldina F. Gaastra¹ · Yvonne Groen¹ · Lara Tucha¹ · Oliver Tucha¹

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Abstract

Background Effectiveness studies indicate various classroom management strategies (CMSs) that are helpful for students with attention-deficit/hyperactivity disorder (ADHD), but little is known about teachers' experiences with these CMSs in school practice.

Objective This study examined primary and secondary school teachers' reported frequency of use and the perceived effectiveness of evidence-based CMSs for students with symptoms of ADHD.

Method Dutch primary ($n=89$) and secondary ($n=51$) school teachers completed a survey in which they reported how often they use and how effective they experience several CMSs for students with ADHD symptoms. The frequency of use of CMSs was also rated for typically developing (TD) students.

Results Teachers reported applying antecedent-based CMSs most often and self-regulation CMSs least often, which was in accordance with the perceived effectiveness of these types of CMSs. Primary school teachers applied antecedent-based CMSs more often for students with ADHD symptoms than for TD students, whereas secondary school teachers did not adapt their use of CMSs especially for such students. Secondary school teachers with a more positive attitude towards ADHD reported that they use CMSs more frequently for students with ADHD symptoms. Other teacher characteristics did not play a significant role.

Conclusion Teachers' reported frequency of use and the perceived effectiveness of CMSs for students with ADHD symptoms do not conform to evidence-based effectiveness. Regarding the use of CMSs, secondary school teachers generally do not provide additional support for students with ADHD symptoms. These findings have important implications for the provision of adequate teacher training.

Keywords ADHD · Teachers · Classroom management strategies · Inclusive classroom

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Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder diagnosed in 5–7% of children and adolescents (Polanczyk et al. 2007; Thomas et al. 2015; Willcutt 2012). Because inclusive education policies require regular schools to include students with special needs, practically every teacher will teach a student with ADHD. Individuals with ADHD exhibit symptoms of inattention and/or hyperactivity-impulsivity (American Psychiatric Association 2013), which often manifest as behavioral and academic problems in the educational setting (Daley and Birchwood 2010; DuPaul and Stoner 2014). Because of these difficulties, teaching a student with ADHD is associated with increased stress among teachers (Greene et al. 2002; Mulholland et al. 2015). To improve the educational functioning of students with ADHD, teachers may use classroom management strategies (CMSs) that are scientifically proven to be effective (for meta-analytic reviews, see DuPaul and Eckert 1997; DuPaul et al. 2012; Gaastra et al. 2016). However, little is known about teachers' use and the perceived effectiveness of these evidence-based CMSs in school practice. This study examined Dutch primary and secondary school teachers' experiences with CMSs for students with symptoms of ADHD, and looked at how the reported frequency of use and the perceived effectiveness of CMSs are in accordance with evidence-based recommendations. The findings are important for educational policies in the inclusive classroom and may contribute to the improvement of teacher support and training.

Research has indicated that several CMSs improve the educational functioning of students with ADHD (DuPaul and Eckert 1997; DuPaul et al. 2012; Gaastra et al. 2016). Evidence-based CMSs for students with ADHD can be categorized as antecedent-based, consequence-based, and self-regulation (e.g., DuPaul and Weyandt 2006). Antecedent-based CMSs (including academic interventions) manipulate events that precede target behavior, such as the environment, task, or instruction (e.g., seating, tutoring, choice making, and computer-assisted instruction). Conversely, consequence-based CMSs involve the manipulation of events that occur after a target behavior, and consist of reinforcement and punishment to alter the frequency of target behavior (e.g., praise, reprimands, ignoring unwanted behavior, token economy, and response cost). Finally, self-regulation CMSs are interventions implemented by the student to develop self-control and problem-solving skills (e.g., self-instruction, self-monitoring, and self-reinforcement). Recent meta-analytic results show that all three types of CMSs, but particularly consequence-based and self-regulation CMSs, improve the classroom behavior of students with ADHD (Gaastra et al. 2016). Antecedent-based CMSs (including academic interventions) seem to be most suitable for increasing academic performance (DuPaul et al. 2012).

Few studies have examined teachers' knowledge or use of evidence-based CMSs for students with ADHD in school practice (e.g., Arcia et al. 2000; Blotnick-Gallant et al. 2015; Hart et al. 2017; Martinussen et al. 2011; Mulligan 2001; Murray et al. 2011). Poznanski et al. (2018) examined pre-service teachers' knowledge of CMSs and concluded that important knowledge gaps exist with regard to recognizing effective commands, positive reinforcement skills, and the assessment of on-task behavior. In-service teachers report that they use behavior modifications (i.e., consequence-based CMSs) and environmental and assignment modifications (i.e., types of antecedent-based CMSs) more frequently for inattentive students than for behavior-typical students (Murray et al. 2011). This finding is in accordance with other studies showing that teachers indicate

that they apply a wide range of CMSs to students with ADHD (Arcia et al. 2000; Blotnicky-Gallant et al. 2015; Hart et al. 2017; Martinussen et al. 2011; Mulligan 2001).

Nevertheless, DuPaul et al. (2018) found that fewer than two-thirds of students with ADHD currently receive educational support (i.e., school-based educational support, intervention, or accommodation, such as tutoring, extra help from a teacher, preferential seating, extra time to complete work, or being enrolled in special education), and only about one-third of students with ADHD receive classroom management (e.g., reward systems, behavioral modifications, or a daily report card). Indeed, teachers report that they use the more work-intensive and individualized CMSs (e.g., response cost, behavior contract, and daily report card) less often than the CMSs that are less effortful (e.g., preferential seating, simplifying instruction, and praise) (Arcia et al. 2000; Blotnicky-Gallant et al. 2015; Hart et al. 2017; Martinussen et al. 2011; Mulligan 2001). Clunies-Ross et al. (2008) observed that teachers most often apply proactive (i.e., antecedent-based) CMSs to students with behavioral problems. Almog and Shechtman (2007), by contrast, observed that Israeli teachers predominantly rely on restrictive and punitive (consequence-based) approaches for students with behavioral problems. This finding goes against teachers' general preference for positive-oriented CMSs (Almog and Shechtman 2007; Lee and Witruk 2016; Power et al. 1995) and may be related to cultural differences. Furthermore, teachers indicate that they use more frequently those CMSs that they perceive to be more effective (Kaff et al. 2007; Mulligan 2001). Owens et al. (2018) found that teachers often do not respond appropriately to challenging behavior. However, a higher percentage of appropriate teacher response is associated with fewer rule violations.

The literature suggests several teacher characteristics that may affect the use of CMSs. Martinussen et al. (2011) found a weak positive association between years of teaching experience and teachers' reported frequency of use of CMSs for students with behavioral problems. Furthermore, these authors demonstrated that general education teachers with moderate to extensive training in managing ADHD indicate that they use CMSs more frequently than those with no or only brief training. Hart et al. (2017), by contrast, found that teachers' reported use of CMSs for students with ADHD is not related to teachers' years of experience and training in ADHD. There is evidence that teachers with more knowledge of ADHD are more prepared to seek professional services and to perceive treatment, including changes within the classroom, as beneficial (Ohan et al. 2008). Blotnicky-Gallant et al. (2015) did not find a significant relationship between teachers' knowledge of ADHD and their reported use of CMSs, but did find a weak association between teachers' beliefs about ADHD and their reported use of CMSs. Teachers with more positive beliefs about ADHD indicated that they apply CMSs more often for students with behavioral problems. Another teacher-related variable that may be important is teacher efficacy. Teacher efficacy represents "teachers' belief or conviction that they can influence how well students learn, even those who may be considered difficult or unmotivated" (Guskey and Passaro 1994, p 628). Almog and Shechtman (2007) showed that higher teacher efficacy is associated with more frequent use of positive-oriented CMSs. Another study, however, found no relationship between teacher efficacy and the preference for three specific CMSs for ADHD (Curtis et al. 2014).

The educational problems of children with ADHD often continue into adolescence (Barkley 2015; Daley and Birchwood 2010; Loe and Feldman 2007). In comparison to primary school, secondary school settings are more demanding in terms of independence, self-control, organization, and time management (DuPaul and Stoner 2014). In addition, students in secondary school follow classes with different teachers, which impedes the implementation of CMSs. CMSs that may be particularly useful for secondary school students include

contingency contracting, self-regulation strategies, computer-assisted instruction, and instruction in study and organizational skills (DuPaul and Stoner 2014). Unfortunately, only a few studies have examined the effectiveness of CMSs for adolescents with ADHD (DuPaul et al. 2012; Gaastra et al. 2016). Hart et al. (2017) examined teachers' reported use of CMSs for children and adolescents with ADHD. The results revealed a reduction in the use of universal and targeted CMSs from primary school to middle school. These findings are in accordance with other studies indicating that primary school teachers are more prepared to apply CMSs for students with disabilities relative to middle or high school teachers (see review of Scott et al. 1998).

The Present Study

Considering the behavioral problems of students with ADHD, it is of high importance that teachers use evidence-based CMSs to improve their classroom behavior. However, to date, there is only limited insight into teachers' experiences with evidence-based CMSs for students with ADHD. Furthermore, the literature is inconsistent with regard to the factors influencing teachers' use of CMSs. Insight into these aspects may be especially relevant for educational policy makers and may contribute to an improvement in teacher support and training.

The present survey study among Dutch general education teachers examines: (a) primary and secondary school teachers' reported frequency of use and the perceived effectiveness of different types of CMSs (i.e., antecedent-based, consequence-based, and self-regulation) for students with symptoms of ADHD; (b) the association between teachers' reported frequency of use and the perceived effectiveness of CMSs; (c) the association between teachers' reported frequency of use of CMSs and teacher characteristics (i.e., teaching experience, knowledge of ADHD, attitude towards ADHD, teacher efficacy, and level of training in managing ADHD); and (d) teachers' experience of barriers and their support needs. In contrast to other studies, the present study compares teachers' reported use of CMSs for students with ADHD symptoms with their reported use of CMSs for typically developing (TD) students. In this way, the study reveals the extent to which teachers adapt their classroom practices to individual students with ADHD symptoms.

We hypothesized that teachers would report using CMSs more frequently for students with symptoms of ADHD than for TD students, particularly antecedent-based CMSs. Consequence-based and self-regulation CMSs may be regarded as more individualized and effortful, which teachers may therefore prefer to a lesser extent. We further hypothesized that the extent to which the frequency of use of CMSs is adapted to students with ADHD would be higher for primary school teachers than for secondary school teachers. Another hypothesis was that teachers' reported frequency of use and the perceived effectiveness of CMSs would be positively related. Consequently, we assumed that antecedent-based CMSs would be perceived as most effective. Given the inconsistency in the literature, we had no specific hypotheses about the role of teacher characteristics. Finally, teachers' experiences of barriers and their support needs were qualitatively described.

Method

Participants

The sample consisted of general education teachers in the Netherlands. In the Netherlands, children aged between 4 and 12 years are included in primary school and adolescents aged from 13 to 18 years are educated in secondary school. During the year 2014, schools in the northern Netherlands received a digital newsletter from an educational support institution with a call for participation in the current study. Participants were also recruited through flyers distributed during a conference for teachers, via social media, and via the researchers' own social network. Participation was voluntary and yielded no reward. The study was approved by the Ethical Committee Psychology of the University of Groningen in the Netherlands.

A total of 140 teachers (84.3% female) between the ages 22 and 63 years ($M=43.3$, $SD=11.85$) participated. All except one were Caucasian. Participants had at least 1 year of teaching experience ($M=16.6$ years, $SD=10.75$). Table 1 shows the participants' characteristics, separated for primary and secondary school (see "Materials" section for a description of the included scales). Compared to secondary school teachers, relatively more primary school teachers were female ($p=.007$, Fisher's exact test) and had ever followed training in managing ADHD in the past ($p=.002$, Fisher's exact test). Furthermore, primary school teachers had more knowledge about ADHD ($t(138)=4.98$, $p<.001$). There were no significant group differences with regard to age, ethnicity, teaching experience, attitude towards ADHD, and teacher efficacy.

Materials

Classroom Management Strategies Questionnaire

We developed a questionnaire to assess teachers' self-reported frequency of use and the perceived effectiveness of CMSs. The questionnaire consisted of 30 items relating to CMSs recommended to support students with ADHD (see Table 2 for an overview of the items). The

Table 1 Participant characteristics

Characteristic	Primary school teachers ($n=89$) M (SD)	Secondary school teachers ($n=51$) M (SD)	Group differences
Sex (% female)	91.0	72.5	$p=.007^*$ (Fisher's exact test)
Age (years)	43.4 (12.06)	43.2 (11.59)	$t(138)=0.12$, $p=.902$
Ethnicity (% Caucasian)	100.0	98.0	$p=.364$ (Fisher's exact test)
Teaching experience (years)	17.4 (11.08)	15.0 (10.06)	$t(138)=1.30$, $p=.196$
ADHD training (% yes)	50.6	23.5	$p=.002^*$ (Fisher's exact test)
ADHD knowledge	54.4 (13.52)	42.3 (14.39)	$t(138)=4.98$, $p<.001^{**}$
ADHD attitude	3.7 (0.33)	3.6 (0.36)	$t(138)=1.36$, $p=.177$
Teacher efficacy	4.1 (0.41)	4.1 (0.43)	$t(138)=0.14$, $p=.886$

* $p<.01$; ** $p<.001$

Table 2 Mean scores, standard deviations, and correlations of the reported frequency of use and the perceived effectiveness of classroom management strategies (CMS) for students with symptoms of ADHD and typically developing (TD) students

Item	Frequency of use		Effectiveness		r_t
	ADHD	TD	ADHD		
	$M (SD)$	$M (SD)$	$M (SD)$		
1. Teach appropriate behaviors (e.g., attending, waiting, helping, sharing)	3.19 (0.663)	3.24 (0.674)	2.61 (0.685)		.16
2. Use clear classroom rules	3.72 (0.481)	3.50 (0.617)	2.88 (0.754)		.21*
3. Post classroom rules in view (e.g., hanging on wall)	2.51 (1.249)	2.35 (1.235)	2.25 (0.968)		.51**
4. Assign seating with least distraction (e.g., near teacher, on a distance of specific classmates)	3.19 (0.862)	2.06 (0.867)	2.81 (0.755)		.16
5. Adjusted seating (e.g., stability balls, seat cushions)	1.34 (0.794)	1.21 (0.516)	1.60 (0.776)		.48**
6. Prepare transitions with predictable routines	2.96 (0.925)	2.81 (0.878)	2.68 (0.816)		.48**
7. Give clear and simple instructions (e.g. adjust language, stepwise instructions)	3.23 (0.762)	2.86 (0.789)	2.86 (0.732)		.34**
8. Support oral instructions with visual material (e.g., written text, pictures)	2.74 (0.903)	2.76 (0.862)	2.69 (0.805)		.46**
9. Provide individual assistance with assignments	2.96 (0.776)	2.56 (0.681)	3.06 (0.643)		.31**
10. Providing a peer tutor to help the child with assignments	2.31 (0.787)	2.49 (0.809)	2.45 (0.752)		.53**
11. Shorten assignments or chunk assignments into smaller pieces	2.61 (0.986)	2.11 (0.730)	2.73 (0.830)		.54**
12. Allow choice of different assignments	1.99 (0.869)	2.39 (0.918)	2.11 (0.811)		.49**
13. Use of computer for instructions or assignments	2.08 (0.906)	2.26 (0.862)	2.35 (0.913)		.52**
14. Allow another execution of assignments or tests (e.g., oral report, poster)	1.74 (0.903)	1.80 (0.858)	2.15 (1.010)		.64**
15. Allow motor or other breaks during assignments	2.46 (0.884)	1.91 (0.773)	2.66 (0.855)		.59**
16. Give specific and positive formulated directions about behavior (e.g., “Chris, sit quietly with your hands at your side”) (= specific and positive) instead of “Stop fidgeting” (= abstract and negative)	2.95 (0.808)	2.74 (0.799)	2.84 (0.722)		.21*
17. Ignore inappropriate behavior that is not severe or non-disruptive to class (e.g., fidgeting, chewing on a pen)	3.26 (0.733)	2.86 (0.845)	2.87 (0.812)		.32**
18. Praise appropriate behavior (e.g., “I like the way you’re working quietly, Chris”)	3.20 (0.681)	3.17 (.667)	3.14 (0.702)		.44**
19. Reward appropriate behavior (e.g., stickers, extra playtime)	2.33 (0.933)	2.21 (0.869)	2.50 (0.917)		.50**
20. Reprimands for inappropriate behavior (e.g., put children’s name on the board, verbal reprimands)	2.14 (0.902)	2.11 (0.814)	1.98 (0.791)		.60**

Table 2 (continued)

Item	Frequency of use		Effectiveness		r_t
	ADHD	TD	ADHD		
	M (SD)	M (SD)	M (SD)		
21. Use time-out for inappropriate behavior (e.g., set the child apart, outside the classroom)	1.91 (0.804)	1.81 (0.709)	2.09 (0.844)		.51**
22. Penalize inappropriate behavior (e.g., take away playtime, give extra assignment)	1.51 (0.662)	1.64 (0.669)	1.61 (0.810)		.63**
23. Use group or class incentives (e.g., special activity for all if whole group or class behaves)	2.26 (0.878)	2.41 (0.839)	2.41 (0.913)		.57**
24. Use behavior report card that is sent or given to parents	1.31 (0.624)	1.22 (0.576)	1.59 (0.804)		.61**
25. Use individual behavior plan (e.g., contract with behavior goals, individual reward program)	1.79 (0.993)	1.51 (0.782)	2.05 (0.939)		.66**
26. Let the child monitor his/her own behavior (e.g., the child record whether he/she is or is not on-task at specific moments, the child evaluates his/her behavior after the lesson)	1.90 (0.867)	1.84 (0.810)	2.19 (0.897)		.54**
27. Let the child check his/her own school work					
28. Let the child monitor his/her own progress (e.g., in a graph)	2.51 (0.963)	2.80 (0.875)	2.21 (0.820)		.47**
29. Teach the child self-instruction techniques (e.g., stepwise approach, stop-think-do method)	1.38 (0.694)	1.49 (0.791)	1.75 (0.891)		.46**
30. Teach the child anger management strategies (e.g., emotion thermometer)	2.18 (0.998)	2.05 (0.859)	2.29 (0.962)		.58**
	1.74 (0.964)	1.58 (0.690)	2.10 (1.048)		.68**

Antecedent-based CMSs: items 1–15; consequent-based CMSs: items 16–25; self-regulation CMSs: items 26–30

* $p < .01$; ** $p < .001$

items were selected from existing CMSs questionnaires (e.g., Kos 2004; Martinussen et al. 2011; Mulligan 2001; Murray et al. 2011) and were based on a recent meta-analytic review on the effectiveness of CMSs for students with symptoms of ADHD (Gaastra et al. 2016). Each CMS can be categorized as antecedent-based (15 items), consequence-based (10 items), or self-regulation (5 items). Participants read a short description of symptoms that children with ADHD often exhibit. They were then asked to think of one specific student with such symptoms that they teach and to provide information regarding sex, grade, whether the student had a formal diagnosis of ADHD (*yes, no, maybe*), and ADHD subtype (*inattentive type, hyperactive-impulsive type, combined type*). Subsequently, they were presented with the CMS items and were asked to rate the frequency of use and effectiveness in reducing problem behavior for each item. After completion, they were instructed to think of a comparable student of the same sex in the same classroom without symptoms of ADHD (TD student) and to rate only the frequency of use of each CMS item again for this particular student.

Responses for the frequency of use of CMSs were rated on a four-point Likert scale (*1 = never/rarely, less than once a month; 2 = sometimes, minimally once a month; 3 = regularly, minimally once a week; 4 = very often/always, minimally once a day*). Responses regarding the effectiveness of CMSs were also rated on a four-point Likert scale (*1 = no effect, problem behavior remains the same; 2 = moderate effect, problem behavior decreases a bit; 3 = good effect, problem behavior decreases significantly; 4 = very good effect, problem behavior is hardly evident anymore*). If participants did not use a particular CMS, they were asked to estimate the effectiveness of this CMS in case they would use it. Per participant, a mean score was computed for the frequency of use and the perceived effectiveness of all CMSs, as well as each type of CMS (i.e., antecedent-based, consequence-based, and self-regulation). A higher score indicated more frequent use or a higher perceived effectiveness of the CMSs. In the present study, the internal consistency of the total frequency of use (ADHD: $\alpha = .84$; TD: $\alpha = .80$) and total effectiveness ($\alpha = .90$) was good. Cronbach's alpha was acceptable to good for antecedent-based CMSs (use ADHD: $\alpha = .80$; use TD: $\alpha = .71$, effectiveness: $\alpha = .87$), questionable to acceptable for consequence-based CMSs (use ADHD: $\alpha = .66$; use TD: $\alpha = .66$; effectiveness: $\alpha = .71$), and poor to acceptable for self-regulation CMSs (use ADHD: $\alpha = .59$; TD: $\alpha = .69$; effectiveness: $\alpha = .77$).

ADHD Knowledge Questionnaire

Participants' knowledge about ADHD was measured using a self-report questionnaire developed by researchers at the Department of Clinical and Developmental Neuropsychology of the University of Groningen. The questionnaire consists of 34 statements about several aspects of ADHD (e.g., symptoms, etiology, and treatment). Examples of items are 'Most people with ADHD have an impaired IQ' and 'Pharmacological treatment with stimulants reduces hyperactivity of children with ADHD.' Participants indicated whether a statement was *true, false*, or that they *did not know*. The level of knowledge about ADHD was reflected by the percentage of correct responses. The internal consistency of the questionnaire was acceptable ($\alpha = .75$).

ADHD Attitudes Questionnaire

To assess participants' attitudes towards ADHD, we used 25 of the 31 original items from a self-report questionnaire developed by Kos (2004). These items reflect clearly negative

or positive attitudes towards ADHD. An example of an item reflecting a positive attitude is ‘Most students with ADHD don’t really disrupt classes that much.’ An example of an item reflecting a negative attitude is ‘ADHD children cannot change the way they behave.’ Participants rated the extent to which they agreed or disagreed with each statement. In the present study, responses were given on a five-point Likert scale ranging from *1 = strongly disagree* to *5 = strongly agree*. Negatively phrased statements were reverse scored so that a higher mean score indicated a more positive attitude towards ADHD. The internal consistency of the questionnaire was acceptable ($\alpha = .70$).

Teacher Efficacy Questionnaire

Teacher efficacy was assessed by the subscale ‘Classroom Management/Discipline’ of the teacher efficacy questionnaire of Emmer and Hickman (1991). This subscale consists of 14 items reflecting beliefs about the respondent’s own skills and capabilities in classroom management and discipline. Examples of items are ‘I can keep a few problem students from ruining an entire class’ and ‘I don’t always know how to keep track of several activities at once.’ Unlike the original questionnaire, we used a five-point Likert scale ranging from *1 = strongly disagree* to *5 = strongly agree*. Negatively phrased items were reverse scored so that a higher mean score indicated higher teacher efficacy. The internal consistency of the questionnaire was acceptable ($\alpha = .77$).

Need for Support

In the section about the support needs, participants indicated what hindered them in using particular CMSs, what support they received from schools to manage students with ADHD, whether they had a need for information about ADHD, and if so, in what form, and whether they felt a need for training in managing students with ADHD in the classroom, and if yes, how much time they were willing to invest in such training.

Procedure

Participants could access the online survey (Qualtrics, Provo, UT) through a hyperlink. The survey started with an informed consent form and continued with the different sections of the survey (demographics, ADHD knowledge, teacher efficacy, CMSs, ADHD experience, ADHD attitude, need for support), followed by a debriefing. Among other descriptive information, participants provided their years of teaching experience. In the subsection about ADHD experience, participants indicated whether they had ever followed a workshop or training in managing behavioral problems in the classroom. The survey completion time was about half an hour.

Data Analyses

The CMSs questionnaire was developed mainly on the basis of the literature referring to primary school teachers. To determine whether the CMS items are also applicable to secondary school teachers, we computed for each CMS the percentage of secondary school teachers that indicated to ‘never/rarely’ use this particular CMS. Every CMS that was used by less than 15% of secondary school teachers was considered as a CMS that is ‘not or less applicable’ to secondary school teachers. Subsequently, the

next analyses on the CMSs questionnaire were performed both including and excluding these ‘not or less applicable’ CMSs.

The main variables of the study were the (reported) frequency of use and the (perceived) effectiveness of CMSs, indicated by the mean scores on the CMSs questionnaire. To examine teachers’ frequency of use of CMSs for students with symptoms of ADHD as well as for TD students, we performed a mixed ANOVA for the frequency of use of CMSs with factors such as strategy type (antecedent-based, consequence-based, self-regulation), ADHD status (ADHD, typical), and school setting (primary school, secondary school). The same analysis was performed for the effectiveness of CMSs, excluding the factor of ADHD status, because the effectiveness was only rated for students with symptoms of ADHD. For the mixed ANOVAs, we applied a Greenhouse–Geisser correction in case the assumption of sphericity was violated. To examine the association between the frequency of use and the effectiveness of CMSs for students with symptoms of ADHD, we computed Kendall’s tau between the ratings of frequency of use and effectiveness for each CMS item.

Primary and secondary school teachers differed significantly regarding variables that are potentially related to the frequency of use of CMSs. We therefore performed a separate multiple linear regression analysis for each group to identify relevant teacher characteristics associated with the frequency of use of CMSs for students with ADHD symptoms. Because of the explorative nature of the analyses and our interest in the unique contribution of each factor, we conducted simultaneous (forced entry) regression analyses. Teacher characteristics that were included as predictors in the analyses were experience (years of teaching experience), knowledge (% correct answers on ADHD knowledge questionnaire), attitude (mean score on ADHD attitudes questionnaire), efficacy (mean score on teacher efficacy questionnaire), and training (1 = ever received training in managing behavioral problems in the classroom, 0 = received no such training).

All statistical analyses were performed using the Statistical Package for the Social Sciences version 24. For the correlation analyses, we adopted a conservative significance level (alpha) of .001 to correct for multiple testing. For the other analyses, we adopted a liberal significance level of .05 and used the effect sizes to interpret the results. A partial eta squared (for the ANOVAs) of .01, .06, and .14 and a semi-partial correlation (for the regression analyses) of .10, .30, and .50 were considered small, medium, and large respectively (Cohen 1988). Teachers’ experiences of barriers and their support needs were qualitatively described based on participants’ answers in the subsection on support needs.

Results

Descriptors of Student Characteristics

Teachers completed the CMSs questionnaire for 140 students (84.3% boys) with symptoms of ADHD, from kindergarten to twelfth grade (Mdn = grade 5). A small majority (60.7%) of these students had a formal diagnosis of ADHD, 30% had no ADHD diagnosis, and 9.3% had a possible ADHD diagnosis. Teachers characterized 58.6% as ADHD combined type, 27.9% as ADHD hyperactive-impulsive type, and 13.6% as ADHD inattentive type.

Descriptors of CMS Items

An overview of the mean scores with standard deviations on the individual CMS items is provided in Table 2. Teachers used strategies 1, 2, and 18 regularly to always (mean score of three or higher) for both students with symptoms of ADHD and TD students. Additionally, strategies 4, 7, and 17 were used regularly to always for students with ADHD symptoms. Teachers used strategies 5, 24, and 28 least often (mean score of less than one and a half). Other strategies that were used rarely to sometimes (mean score of less than two) included strategies 12, 14, 21, 22, 25, 26, and 30. The findings for the effectiveness of CMS items were similar, meaning that CMSs that were used more often were generally perceived as more effective.

Applicability of CMSs to Secondary School Teachers

See Online Resource 1 for an overview of the percentage of secondary school teachers that indicated to never or rarely use particular CMSs. Only item 5 ('adjusted seating') was used by less than 15% of secondary school teachers. Separate analyses with and without item 5 did not show any significant differences in results. Therefore, we report only the outcomes of the analyses including all 30 CMS items.

Frequency of Use of CMSs

Figure 1 shows the mean scores with 95% confidence intervals of the frequency of use of the three types of CMSs for students with symptoms of ADHD as well as for TD students, separated for primary and secondary school teachers. For both students with ADHD symptoms and TD students, primary as well as secondary school teachers used antecedent-based CMSs more frequently than consequence-based CMSs (all contrasts: $p \leq .001$, $.15 \leq \eta_p^2 \leq .50$). Self-regulation CMSs were applied less often than both consequence-based CMSs (all contrasts: $p < .001$, $.08 \leq \eta_p^2 \leq .40$) and antecedent-based CMSs (all contrasts: $p < .001$, $.45 \leq \eta_p^2 \leq .62$). Teachers used antecedent-based CMSs significantly more often for students with ADHD symptoms than for TD students ($M_{\text{difference}} = 0.14$, $p < .001$,

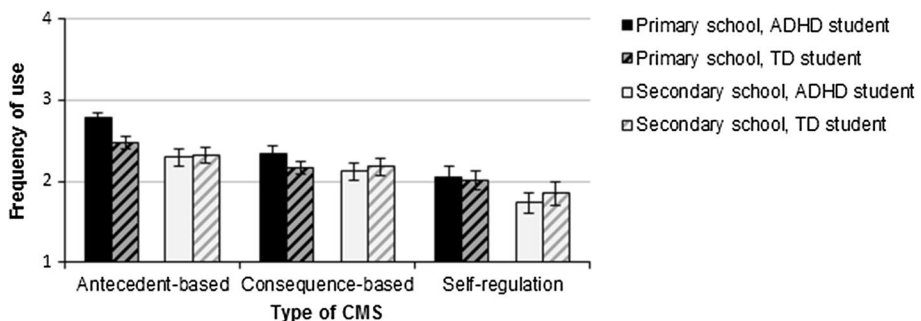


Fig. 1 Bar graph (mean scores with 95% confidence intervals) of primary and secondary school teachers' reported frequency of use of several types of classroom management strategies (CMSs) for students with symptoms of ADHD as well as for typically developing (TD) students. Frequency of use was rated from 1 = 'never/rarely' to 4 = 'very often/always'

$\eta_p^2=.13$, medium effect). However, there were no differences in the frequency of use of consequence-based CMSs ($M_{\text{difference}}=0.07$, $p=.056$, $\eta_p^2=.03$) and self-regulation CMSs ($M_{\text{difference}}=0.03$, $p=.353$, $\eta_p^2=.01$) for students with symptoms of ADHD and TD students. This was indicated by a significant ADHD status \times Strategy type interaction ($F(2, 276)=9.19$, $p<.001$, $\eta_p^2=.06$, small effect).

There was a difference between primary and secondary school teachers' frequency of use of CMSs, as indicated by a significant Strategy type \times School setting interaction ($F(1.67, 230.38)=3.60$, $p=.037$, $\eta_p^2=.03$, small effect). Compared to secondary school teachers, primary school teachers more frequently applied antecedent-based CMSs ($M_{\text{difference}}=0.32$, $p<.001$, $\eta_p^2=.18$, large effect) and self-regulation CMSs ($M_{\text{difference}}=0.24$, $p=.007$, $\eta_p^2=.05$, small effect). Both types of teachers did not differ with regard to the frequency of use of consequence-based CMSs ($M_{\text{difference}}=0.10$, $p=.075$, $\eta_p^2=.02$).

A significant ADHD status \times School setting interaction ($F(1, 138)=24.34$, $p<.001$, $\eta_p^2=.15$, large effect) indicated that primary and secondary school teachers differed in their frequency of use of CMSs for students with symptoms of ADHD and TD students. Whereas primary school teachers applied CMSs more often for students with symptoms of ADHD than for TD students ($M_{\text{difference}}=0.18$, $p<.001$, $\eta_p^2=.21$, large effect), secondary school teachers appeared not to adapt their use of CMSs to students with symptoms of ADHD ($M_{\text{difference}}=0.06$, $p=.103$, $\eta_p^2=.02$). Further examination of this interaction showed that primary and secondary school teachers differed significantly in their frequency of use of CMSs for students with ADHD symptoms ($M_{\text{difference}}=0.34$, $p<.001$, $\eta_p^2=.22$, large effect) but not for TD students ($M_{\text{difference}}=0.10$, $p=.082$, $\eta_p^2=.02$). The three-way interaction of Strategy type \times ADHD status \times School setting was not significant ($F(2, 276)=1.92$, $p=.149$, $\eta_p^2=.01$).

Effectiveness of CMSs

Figure 2 shows the mean scores with 95% confidence intervals of the effectiveness of the three types of CMSs for students with symptoms of ADHD, separated for primary and secondary school teachers. In line with the frequency of use, primary school teachers reported a higher effectiveness of antecedent-based CMSs ($M_{\text{difference}}=.23$, $p=.007$, $\eta_p^2=.05$, small effect) and self-regulation CMSs ($M_{\text{difference}}=0.31$, $p=.009$, $\eta_p^2=.05$, small effect) as compared to secondary school teachers, whereas the perceived

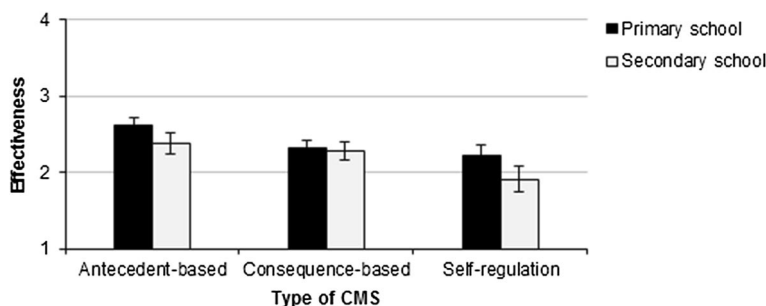


Fig. 2 Bar graph (mean scores with 95% confidence intervals) of primary and secondary school teachers' perceptions of the effectiveness of several types of classroom management strategies (CMSs) for students with symptoms of ADHD. Effectiveness was rated from 1 = 'no effect' to 4 = 'very good effect'

effectiveness of consequence-based CMSs did not differ significantly between both types of teachers ($M_{\text{difference}}=0.05$, $p=.485$, $\eta_p^2<.01$). This was indicated by a significant Strategy type \times School setting interaction ($F(1.85, 255.07)=4.36$, $p=.016$, $\eta_p^2=.03$, small effect). Further examination of this interaction showed that both primary ($M_{\text{difference}}=0.39$, $p<.001$, $\eta_p^2=.31$, large effect) and secondary ($M_{\text{difference}}=0.47$, $p<.001$, $\eta_p^2=.49$, large effect) school teachers experienced antecedent-based CMSs as more effective than self-regulation CMSs. However, primary school teachers rated consequence-based CMSs as less effective than antecedent-based CMSs ($M_{\text{difference}}=0.28$, $p<.001$, $\eta_p^2=.31$, large effect), and equally effective as self-regulation CMSs ($M_{\text{difference}}=0.11$, $p=.052$, $\eta_p^2=.04$), whereas secondary school teachers reported consequence-based CMSs as equally effective as antecedent-based CMSs ($M_{\text{difference}}=0.11$, $p=.070$, $\eta_p^2=.07$), but more effective than self-regulation CMSs ($M_{\text{difference}}=0.36$, $p<.001$, $\eta_p^2=.33$, large effect).

The correlations between the frequency of use and effectiveness of CMSs can be found in Table 2. Kendall's tau ranged from .16 ($p=.043$) to .68 ($p<.001$). Twenty-six out of 30 CMSs reached significance ($p<.001$), indicating a positive association between the frequency of use and the perceived effectiveness of the CMS.

Teacher Characteristics

The results of the regression analyses are shown in Table 3. For primary school teachers, the regression analysis showed that none of the individual teacher factors significantly predict the frequency of use of CMSs for students with symptoms of ADHD, nor could the teacher factors collectively ($F(5, 83)=1.68$, $p=.149$, $R^2=.09$, $R_{\text{adj}}^2=.04$). For secondary school teachers, only attitude showed a significant relationship with the frequency of use of CMSs ($sr=.29$, small effect). The regression model for secondary school teachers including all teacher factors could explain 15% of variation in teachers' frequency of use of CMSs for students with symptoms of ADHD, which was not significant ($F(5, 45)=1.57$, $p=.189$, $R^2=.15$, $R_{\text{adj}}^2=.05$).

Table 3 Outcomes of regression analyses of the reported frequency of use of classroom management strategies for students with symptoms of ADHD

Predictor	Primary school teachers ($n=89$)						Secondary school teachers ($n=51$)				
	b (SE)	β	$t(83)$	p	sr		b (SE)	β	$t(45)$	p	sr
Constant	2.20 (0.422)						0.78 (0.582)				
Experience	0.00 (0.003)	0.06	0.47	.637	.04		0.00 (0.005)	-0.01	-0.03	.978	-.01
Knowledge	0.22 (0.244)	0.10	0.89	.379	.08		0.37 (0.330)	0.16	1.12	.269	.16
Attitude	-0.01 (0.099)	-0.01	-0.11	.916	-.03		0.31 (0.149)	0.33	2.05	.046*	.29
Efficacy	0.04 (0.087)	0.06	0.51	.614	.06		0.03 (0.121)	0.04	0.28	.785	.02
Training	0.13 (0.068)	0.22	1.88	.064	.20		-0.01 (0.122)	-0.02	-0.10	.920	-.03

Primary school teachers: $R^2=.09$, $R_{\text{adj}}^2=.04$; Secondary school teachers: $R^2=.15$, $R_{\text{adj}}^2=.05$

* $p<.05$

Barriers and Support Needs

Teachers experienced several barriers to using particular CMSs, which were comparable among primary and secondary school teachers. Almost half (46.4%) of teachers indicated that the classroom situation and working conditions represent a problem. They mainly pointed to large class sizes, class composition consisting of multiple students with disabilities, and a lack of time. About one-fifth of teachers (21.4%) reported that they do not apply all CMSs because they adapt their use to the individual student, selecting only the CMSs that are sufficiently helpful and disregarding those that are ineffective or unnecessary for the student. Another reason (12.1% of teachers) was unfamiliarity or insufficient knowledge of or experience with particular CMSs. A small proportion (7.9%) of teachers indicated that they use only CMSs that correspond to their personality or conviction. For example, some teachers believed that exclusively positive-oriented CMSs should be used. Another opinion (5.7% of teachers) was that students with ADHD should not have an exceptional position and that particular CMSs would be unfair or would be used at the cost of other students. Finally, a few (2.9%) teachers mentioned that they stick to their routine and just forget or do not think about some CMSs.

Most teachers indicated that their school provides support in one or more ways. About half of primary (59.6%) and secondary (47.1%) school teachers knew about the existence of individual action plans for students. Furthermore, 22.5% of primary schools and 7.8% of secondary schools organize collegial meetings (i.e., peer-to-peer learning). More than half (57.3%) of primary school teachers and a smaller proportion (17.6%) of secondary school teachers could receive internal support from a coach, care team, or teaching assistant. In addition, 15.7% of primary and 9.8% of secondary school teachers could consult or rely on external professionals. About one-fifth of primary (20.2%) and secondary (17.6%) schools provide the opportunity to follow (re)training or a workshop to manage students with behavioral problems. Finally, a minority of primary (6.7%) and secondary (21.6%) school teachers experience little or no support from their school.

Teachers were asked about their support needs. On the question of what would help them to better manage students with ADHD in the classroom, 12.4% of primary and 31.4% of secondary school teachers responded that they do not know or that they need nothing more. All other teachers made some recommendations. About a quarter (23.6%) of primary school teachers indicated that a teaching assistant would help them. Primary (12.4%) and secondary (29.4%) school teachers furthermore asserted that smaller class sizes with fewer students with disabilities would be helpful for them. Some primary (7.9%) and secondary (9.8%) school teachers indicated that they had a need for more time. Finally, a substantial proportion of primary (29.2%) and secondary (23.5%) school teachers suggested that they would like to have more knowledge and tools for managing students with ADHD. This was further specified through the questions regarding teachers' need for information and training. A proportion of primary (36%) and secondary (20%) school teachers indicated that they would appreciate more information about ADHD in the form of literature, videos, collegial meetings, or a lecture. About half of primary (52%) and secondary (45%) school teachers mentioned a need for training in managing students with ADHD in the classroom. The time that teachers were willing to invest in such training was, on average, one half-day to 1 day a year.

Discussion

The main aim of this survey study was to examine primary and secondary school teachers' reported frequency of use and the perceived effectiveness of CMSs for students with symptoms of ADHD. The results show that teachers report that they apply CMSs more often for students with ADHD symptoms than for TD students. However, this was only the case for primary school teachers and only with regard to antecedent-based CMSs. Thus, it was found that Dutch primary school teachers do provide additional support for students with ADHD, but only in the form of antecedent-based CMSs. This corroborates findings that teachers in the US report that they use CMSs, particularly environmental and assignment modifications, more frequently for inattentive students than for behavior-typical students (Murray et al. 2011). However, the results are not in line with effectiveness studies on the different types of CMSs. Effectiveness studies indicate that consequence-based and self-regulation CMSs result in the largest behavioral improvement in students with ADHD (Gaastra et al. 2016), while antecedent-based CMSs are most effective for increasing academic performance (DuPaul et al. 2012), which may be the primary focus of teachers. In this context, we want to point out that DuPaul et al. (2012) examined the effectiveness of academic interventions, which is somewhat different from our definition of antecedent-based CMSs. Other explanations for our findings are discussed below.

The present study demonstrates that primary as well as secondary school teachers report that they apply antecedent-based CMSs most often for both students with symptoms of ADHD as well as for TD students. Furthermore, they report using consequence-based CMSs more frequently than self-regulation CMSs. This is in line with findings that Australian teachers apply proactive CMSs more often than reactive CMSs (Clunies-Ross et al. 2008). There may be several explanations for these findings. In the present study, teachers generally reported that they most often use the CMSs that are easy to implement (e.g., preferential seating, simple instructions, and praise), and least often use the CMSs that are more individualized (e.g., daily report card, individual behavior plan, and teaching self-monitoring skills) or negative-oriented (e.g., time-out and mild punishment). Thus, teachers seem to avoid more individualized and negative-oriented approaches, such as consequence-based and self-regulation CMSs. These results correspond to previous findings that teachers predominantly rely on less work-intensive CMSs (Arcia et al. 2000; Blotnicky-Gallant et al. 2015; Martinussen et al. 2011; Mulligan 2001) and prefer positive-oriented CMSs (Almog and Shechtman 2007; Lee and Witruk 2016; Power et al. 1995).

The results can be further explained in the context of a three-tiered, data-based, problem-solving model (DuPaul et al. 2011). In this model, interventions are categorized into three tiers, with universal interventions for all students (Tier 1), targeted interventions for at-risk students (Tier 2), and individualized interventions (e.g., response cost, time-out, and self-management) for students who do not sufficiently benefit from Tier 2 interventions (Tier 3). It is likely that not all students of the present study had such severe problems requiring Tier 3 CMSs, which mainly consist of consequence-based and self-regulation CMSs. Finally, self-regulation CMSs may be less familiar to teachers.

In accordance with teachers' reported frequency of use, primary as well as secondary school teachers rated antecedent-based CMSs as most effective and self-regulation CMSs as least effective in reducing behavioral problems. However, the evidence base for effectiveness is the opposite: consequence-based and self-regulation interventions are most effective in achieving behavioral improvements (Gaastra et al. 2016). One explanation may be provided by our finding of a strong association between teachers' reported frequency of

use and the perceived effectiveness of CMSs; this has also been found in previous studies (Kaff et al. 2007; Mulligan 2001). When teachers indicate a strategy as being less effective, this may be because they either do not or only rarely use this strategy, perhaps because they do not know about its effectiveness. Some teachers indeed remarked that they reported a low effectiveness for a strategy because they could not estimate its effectiveness. The association may also be the other way around. Teachers may more often use those CMSs that they experience as more effective. This would suggest that teachers deliberately apply CMSs that they consider effective for students. Given the discrepancy between teachers' perceptions of effectiveness and the evidence base for effectiveness of CMSs, adequate teacher training for the management of ADHD is vital (see “[Implications](#)” section).

Differences Between Primary and Secondary School Teachers

The present study reveals several differences between primary and secondary school teachers. Whereas primary school teachers indicated that they apply CMSs substantially more often to students with symptoms of ADHD than to TD students, secondary school teachers reported that they use CMSs equally often for both types of students. Thus, secondary school teachers generally do not seem to adapt their CMSs to individual students with ADHD symptoms. Primary and secondary school teachers further differ in terms of the types of CMSs they reported using. Primary school teachers seem to apply antecedent-based CMSs considerably more often and self-regulation CMSs somewhat more often than secondary school teachers. In line with these differences, primary school teachers rated antecedent-based and self-regulation CMSs as somewhat more effective as compared to secondary school teachers. These findings are in accordance with previous research indicating that primary school teachers are somewhat more favorable to making adaptations for students with disabilities compared to secondary school teachers (Hart et al. 2017; Scott et al. 1998).

The differences in the reported frequency of use and perceived effectiveness of CMSs between primary and secondary school teachers may be explained by variables associated with the teacher, educational setting, and the child. Primary and secondary school teachers varied on several characteristics. For example, a higher proportion of primary school teachers was female and had followed training in managing behavioral problems. Furthermore, primary school teachers had more knowledge about ADHD. It is unlikely, however, that these variables alone explain the differences in teachers' reported frequency of use and their perceived effectiveness of CMSs, because the regression analyses provide evidence that these factors play only a negligible or small role. Other differences between primary and secondary school teachers concern the educational setting in the Netherlands. Whereas primary school teachers are generally responsible for one class and therefore have more intense contact with their students, secondary school teachers have to deal with several classes. Secondary school teachers may therefore experience that the benefits of implementing CMSs for a particular student do not outweigh the costs.

Another explanation may not come from teacher or educational characteristics but from student variables, such as age. Teachers report fewer ADHD symptoms and related impairments in adolescents than in children (DuPaul et al. 2014; Narad et al. 2015). This may suggest that secondary school teachers have less need to use extra CMSs for students with ADHD. Furthermore, teachers may adapt their role to the students' age. For example, primary school teachers may serve as an instructor, whereas secondary school teachers may adopt the role of a coach. This could explain why primary school

teachers apply antecedent-based CMSs notably more often than secondary school teachers, as these CMSs are primarily instructional in nature. However, this does not explain why primary school teachers also use self-regulation CMSs more often. Self-regulation CMSs seem to be especially suitable for adolescents, because the student has an active role in the intervention and the teacher functions more as a coach (Clemons et al. 2015; DuPaul and Weyandt 2006). Other potential explanations are that some CMSs may not be appropriate for adolescents or may be difficult to implement consistently in a secondary school setting, or that secondary school teachers are simply not aware of the existence of such CMSs. The present study found that only less than 15% of secondary school teachers use adjusted seating, whereas other CMSs that may be considered as less general practice for secondary school teachers (e.g., use of daily report cards send to parents and post classroom rules in view) were applied by a higher percentage of secondary school teachers. This is a remarkable finding and may need further examination. Because most effectiveness studies have been conducted among primary school children with ADHD, future research could focus on the adolescent population as well.

Teacher Characteristics

Examination of the role of teacher characteristics resulted in a significant but only weak association between secondary school teachers' attitudes towards ADHD and their reported frequency of use of CMSs for students with ADHD symptoms. Secondary school teachers with a more positive attitude towards ADHD were more likely to apply CMSs to these students. This association was not found for primary school teachers. Blotnick-Gallant et al. (2015) found that Canadian primary school teachers with a more positive attitude towards ADHD reported using behavior management CMSs (but not instructional CMSs) somewhat more often. Thus, attitude towards ADHD is likely to be related to the frequency of use of particular CMSs. Another study suggests that teachers' beliefs about the etiology of a student's disability is important (Stanovich and Jordan 1998). For example, Stanovich and Jordan (1998) found that teachers who assume that a student's problems are the result of the interaction between student and environment (interventionist perspective) show more effective teaching behavior as compared to teachers who believe that the problems are inherent to the student (pathogenic perspective).

In the present study, primary and secondary school teachers' reported frequency of use of CMSs was not related to teaching experience, knowledge about ADHD, teacher efficacy, or level of training in managing behavioral problems. Other studies also suggest that these factors play only a negligible or small role (Blotnick-Gallant et al. 2015; Curtis et al. 2014; Hart et al. 2017; Martinussen et al. 2011; Murray et al. 2011; Ohan et al. 2008). Martinussen et al. (2011), however, found a moderate association between the level of Canadian teachers' in-service training in ADHD and their reported frequency of use of instructional CMSs, but a weak relationship between training and the use of behavior management, suggesting that training is related to the frequency of use of some CMSs but not others. Correlational studies like ours cannot make inferences about the directional nature of the relationship. However, experimental effectiveness studies have shown that teacher training can have positive effects on teachers' practices for students with ADHD (Froelich et al. 2012; Miranda et al. 2006; Zentall and Javorsky 2007).

Barriers and Support Needs

The final aim of this study was to gain insight into teachers' experience of barriers and their support needs. Almost half of teachers perceived that large class sizes, the class composition consisting of multiple students with disabilities, and a lack of time are the main reasons for not using particular CMSs. Accordingly, teachers indicated that smaller class sizes with fewer students with disabilities, having a teaching assistant in the classroom, and more time would help them to deal with students with ADHD in the classroom. These barriers are mainly beyond the influence of the teachers themselves and may be predominantly a consequence of recent policies to include students with special needs in regular schools. It is important to highlight that the use of CMSs may also depend on the organization and financing of the educational system of the country, including government cutbacks. Around half of the teachers indicated a need for training in the management of ADHD, both in primary and secondary school. On average, teachers were willing to invest about one half-day to 1 day per year in such training. A small proportion had a need for information in another form, such as literature, videos, collegial meetings, or a lecture. Thus, although teachers expressed a need for professional development, they were unwilling to invest much time in this. This may be due to the perceived high workload, but future research may be necessary to (dis)confirm this suggestion. Teachers indicated that they adapt their use of CMSs to individual students. This is an important finding, because research supports an individual-based approach to classroom management (see Miller and Lee 2013 for a review of functional behavioral assessment).

Most teachers experience support from their school to some extent. Support is provided in the form of individual action plans for students, collegial meetings, internal support from a coach, care team, or teaching assistant, the possibility to approach external professionals, or the opportunity to work on professional development. Remarkably, about one-fifth of secondary school teachers indicated that their school provides no support. Considering the present findings, providing training for secondary school teachers would appear vital.

Limitations and Future Research

The findings must be interpreted within the limitations of this study. First, the sample of teachers may not be representative of the entire population of general education teachers in the Netherlands. Only a small proportion of the approached teachers participated in the study. This may have resulted in a response bias. It is likely that teachers with a higher interest in ADHD completed the survey. These teachers may already be more prepared to support students with behavioral problems. The findings may therefore be an overestimation of teachers' frequency of use of CMSs for students with ADHD symptoms. Another limitation regarding the generalizability of the results concerns the sample of students. Teachers reported their frequency of use of CMSs for a specific student with symptoms of ADHD of their own choice, which was most likely a student with relatively severe problems. The findings may therefore be less representative for students who display milder ADHD-related problems. Nevertheless, about one-third of students selected by the teachers had no formal diagnosis of ADHD, suggesting that students with less severe behavioral problems were also included. Furthermore, the results are most representative for boys with symptoms of ADHD, because the teachers mostly selected male students. A final limitation regarding the sample is its small size, particularly the cell sizes for the analyses of

teacher factors. Future research in larger samples is therefore necessary to formulate more firm conclusions about the role of teacher characteristics.

There are some limitations regarding the CMSs questionnaire. To allow for a comparison between the types of CMSs, we computed mean scores for the CMSs within each type of strategy. However, the internal consistency of the self-regulation CMSs was low, reducing the reliability of the conclusions on the types of CMSs. In addition, conclusions about the role of teacher characteristics are focused on the total frequency of use of CMSs. It is possible, however, that teacher characteristics are more related to the use of particular CMSs. Future research could therefore focus more on associations with individual CMSs. Furthermore, our study solely relied on teachers' self-reporting. Although Clunies-Ross et al. (2008) found a positive association between teachers' reported frequency of use and the observed frequency of use of CMSs, our findings may not accurately reflect teachers' actual daily practices. Future research could, therefore, focus on the validity of the CMS questionnaire and include both self-reports and classroom observations.

Finally, future research can focus on the bridge between science and practice. In inclusive classrooms, it is necessary that interventions are not only effective but also feasible, acceptable, and cost-effective (DuPaul and Weyandt 2006). Researchers and educational professionals may consult together to develop interventions and ways to transfer these interventions to inclusive classrooms. This is important at both primary and secondary school level.

Implications

This study has several implications. Teachers indicated that they do not use particular CMSs because of a lack of time, large class sizes, and class composition that includes multiple students with behavioral problems. This finding suggests that regular schools may have insufficient facilities to adapt to recently changed policies to include students with special needs in regular classes. School boards and educational support professionals may therefore need to consult together regarding how to provide adequate support to teachers, both in primary and secondary school. Teacher training may be provided to increase teachers' knowledge about effective classroom management. For this, current teacher training could be reevaluated and, if necessary, adapted. Such training should include information about not only general CMSs but also individualized CMSs. Guidelines for professional development in education outline that training should be coherent, content-focused, collaborative, active and situated in classroom settings, and should include student data (Leko and Brownell 2009). Teacher training may also focus on attitudes towards ADHD, because our findings show that secondary school teachers' attitudes are related to the frequency with which they use CMSs. It may also be necessary to increase teachers' motivation to invest in such training.

Conclusion

The present study indicates that teachers report using a variety of evidence-based CMSs for students with symptoms of ADHD. However, CMSs that are more individualized, including consequence-based and self-regulation CMSs, are less frequently used. According to recent meta-analytic results, these CMSs in particular lead to the largest behavioral improvement (Gaastra et al. 2016), whereas antecedent-based CMSs are more effective in

increasing academic performance (DuPaul et al. 2012). A striking finding is that secondary school teachers generally do not adapt their classroom practices to students with ADHD symptoms, despite the fact that educational problems for children with ADHD often continue into adolescence (Barkley 2015; Daley and Birchwood 2010; Loe and Feldman 2007). Furthermore, teachers' reported frequency of use of CMSs for students with ADHD symptoms is positively related to the perceived effectiveness of CMSs for such students. However, the perceived effectiveness of CMSs for reducing behavioral problems does not correspond to the evidence base for effectiveness, suggesting that teachers may be insufficiently informed about the effectiveness of different CMSs for students with ADHD. It therefore appears that unfamiliar CMSs are not favored by teachers. School boards and educational professionals thus have a crucial role to play in adequately training teachers and removing barriers to the use of evidence-based effective CMSs.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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